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Attorney's Docket No. 038190/268164

PATENT

In The United States Patent And Trademark Office

In re:	Scott H. Mathews et al.	Confirmation No.: 9288
Appl. No.:	09/902,021	Group Art Unit: 3624
Filed:	July 10, 2001	Examiner: Geoffrey R. Akers
For:	SYSTEMS, METHODS AND COMPTUER PROGRAM PRODUCTS FOR PERFORMING A GENERALIZED CONTINGENT CLAIM VALUATION	

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APPEAL BRIEF TRANSMITTAL
(PATENT APPLICATION – 37 C.F.R. § 1.192)

1. Transmitted herewith, in **triplicate**, is the APPEAL BRIEF in this application, with respect to the Notice of Appeal filed on May 4, 2004.

2. ☐ Applicant claims small entity status.

3. Pursuant to 37 C.F.R. § 1.17(c), the fee for filing the Appeal Brief is:
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APPEAL BRIEF UNDER 37 CFR § 1.192

This Appeal Brief is filed pursuant to the "Notice of Appeal to the Board of Patent Appeals and Interferences" filed May 4, 2004.

1. ***Real Party in Interest.***

The real party in interest in this appeal is The Boeing Company, the assignee of the above-referenced patent application.

2. ***Related Appeals and Interferences.***

There are no related appeals and/or interferences involving this application or its subject matter.

3. ***Status of Claims.***

Claims 1-27 are pending, all of which stand rejected.

4. **Status of Amendments.**

There are no unentered amendments in this application.

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5. ***Summary of the Invention.***

The present invention relates to systems, methods and computer program products for performing a generalized contingent claim valuation. A contingent claim is generally a claim that may be exercised at some time in the future. In this regard, two of the most common forms of a continent claim are a call, where a stock or other financial instrument may be purchased at some point in the future for a predetermined price, and a put, where a stock or other financial instrument may be sold at some time in the future for a predetermined price. Pat. App., p. 1., ll. 6-12. The method of one embodiment of the present invention therefore includes determining a present value distribution of contingent future benefits, $s_T e^{-\mu T}$, attributable to the exercise of the contingent claim at a subsequent time, T, the present value distribution determined by discounting a distribution of contingent future benefits, s_T, according to a first discount rate, μ. *Id.* at p. 11, l. 24 – p. 12, l. 6; and FIG. 2.

A present value of a contingent future investment, xe^{-rT}, required to exercise the contingent claim at the subsequent time is also determined, where the present value of the contingent future investment is determined based upon a second discount rate, r, that need not equal the first discount rate. *Id.* at p. 12, l. 30 – p. 13, l. 7. The value of the contingent claim is then determined based upon the present value distribution of contingent future benefits and the present value of the contingent future investment. For example, the value of the contingent claim can be determined in accordance with the following:

$$E[\max(s_T e^{-\mu T} - xe^{-rT}),0]$$

where s_T represents the random value of the underlying asset at time T, μ is first discount rate, T represents the time until the contingent claim may be exercised, x represents the contingent future investment, and r represents the second discount rate. *Id.* at p. 14, ll. 24-30.

6. ***Issues.***

The issues presented for appeal are as follows:

(a) whether Claims 1-27 are properly rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,381,586 to Glasserman et al., in view of U.S. Patent No. 6,157,918 to Shepherd, and further in view of U.S. Patent No. 6,061,662 to Makivic;

(b) whether Claims 1-27 are properly rejected under 35 U.S.C. § 112, second paragraph, as failing to set forth the subject matter which Applicants regard as the invention; and

(c) whether Claims 19-27 are properly rejected under 35 U.S.C. § 101 for failing to describe a concrete, useful and tangible output.

7. ***Grouping of Claims.***

With respect to Claims 1-27 rejected under 35 U.S.C. § 103(a) based on Glasserman, Shepherd and Makivic, Claims 1-27 stand or fall together, as explained in the Argument section below. As also explained in the Argument section, with respect to Claims 1-27 rejected under 35 U.S.C. § 112, second paragraph, Claims 1-27 stand or fall together. And as to Claims 19-27 rejected under 35 U.S.C. § 101, Claims 19-27 stand or fall together, as explained below.

8. ***Argument.***

A. Whether Claims 1-27 are properly rejected under 35 U.S.C. § 103(a) based on Glasserman, Shepherd and Makivic

In the present application, Claims 1-27 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Glasserman in view of Shepherd, and further in view of Makivic. The Glasserman patent discloses a method of pricing derivative securities by selecting an importance sampling distribution and combining the importance sampling distribution with stratification or Quasi-Monte Carlo (QMC) simulation. As disclosed, Monte Carlo simulation, which is widely used in financial pricing, can be inefficient due to large variances associated with option price estimates produced by the method. As such, a number of variance reduction techniques have been developed to overcome such inefficiencies. In general, then, the method of the Glasserman provides a more efficient Monte Carlo technique with improved variance reduction through the use of Hessian matrices and Eigenvectors. With the method of the Glasserman patent, option prices can be estimated. In this regard, the Glasserman patent provides a number of numerical examples of pricing options according to a risk-neutral valuation approach that defines a risk-free interest rate, r or r_0. In the examples, the Glasserman pricing options method is shown to be more efficient than traditional Monte Carlo methods.

The Makivic patent discloses a Monte Carlo system and method for pricing financial instruments. In this regard, Monte Carlo methods in financial calculations can be based on the

risk-neutral valuation approach, which defines the expected return on the financial instrument to equal the risk-free interest rate. Col. 4, ll. 31-34; and col. 10, ll. 25-27. As disclosed, a path-integral approach is disclosed that relies upon a probability distribution of the complete paths (histories) of a financial instrument. A Metropolis algorithm is used to generate samples of a probability distribution of the paths of the instrument. In this regard, the Metropolis algorithm constructs a Markov process in the path space, which asymptotically samples the path probability distribution to arrive at an equilibrium distribution. Then, if the statistical error is below a desired level of accuracy, Monte Carlo estimates are computed. Then, a Monte Carlo estimate of the option price can be obtained. See col. 5, ll. 55-58; col. 6, ll. 23-25; and col. 6, l. 59 – col. 7, l. 1. Generally, then, the Makivic patent focuses on computing an implied volatility, and making the process more efficient through sampling different regions of the price path space according to the respective contributions to the payoff function.

The Shepherd patent discloses methods and an apparatus relating to formulation and trading of investment contracts. As disclosed, an ordering party inputs contract data relating to a phenomenon that has a range of future outcomes and a future time of maturity. The contract data comprises a number of probabilities of occurrence for each future outcome, and a consideration due a counterparty at or after the time of matching a contract with a counterparty. A counterparty inputs registering data that includes a set of probabilities of occurrence for each outcome in the range. A data processing means prices and matches a contract for the phenomenon from the contract data and registering data. Shepherd '918 Abstract.

As recited in independent Claims 1, 10 and 19 of the present application, respectively, a method, system and computer program product are provided for performing a contingent claim valuation. As recited, a present value distribution of contingent future benefits attributable to the exercise of the contingent claim at a subsequent time is determined by discounting a distribution of contingent future benefits according to a first discount rate. A present value of a contingent future investment required to exercise the contingent claim at the subsequent time is also determined, where the present value of the contingent future investment is determined based upon a second discount rate that need not equal the first discount rate. The value of the contingent claim can then be determined based upon the present value distribution of contingent future benefits and the present value of the contingent future investment.

In contrast to the method, system and computer program product of independent Claims 1, 10 and 19, respectively, none of the Glasserman, Makivic and Shepherd patents, individually or in combination, teach or suggest determining a present value distribution of contingent future benefits. In fact, none of the Glasserman, Makivic and Shepherd patents, individually or in combination, teach or suggest any present value distribution, whether of contingent future benefits or otherwise. Also, none of the Glasserman, Makivic and Shepherd patents, individually or in combination, teach or suggest determining a present value of a contingent future investment with a second discount rate that can differ from a first discount rate used to determine a present value distribution of contingent future benefits, as also recited in independent Claims 1, 10 and 19.

As indicated above, the Shepherd patent discloses methods and an apparatus relating to formulation and trading of investment contracts. In this regard, while the Shepherd patent discloses formulating and trading investment contracts, the Shepherd patent neither teaches nor suggests a method of valuing such contracts, as recited in independent Claims 1, 10 and 19. In contrast, the Shepherd patent merely discloses that net contingent entitlement amounts are determined, without teaching or suggesting a method of determining such entitlement amounts.

In contrast to the Shepherd patent, both the Glasserman and Makivic patents do disclose methods of pricing options. However, neither the Glasserman patent nor the Makivic patent teach or suggest pricing options utilizing two discount rates. As indicated above, both the Glasserman and Makivic patents price options according to the risk-neutral approach, whereby only a single risk-free interest rate is defined. In contrast, the invention of independent Claims 1, 10 and 19 utilize two discount rates that need not equal one another. Further, in valuing options, neither the Glasserman nor the Makivic patents teach or suggest determining a present value distribution of contingent future benefits. In this regard, the Glasserman patent discloses a more efficient Monte Carlo technique with improved variance reduction through the use of Hessian matrices and Eigenvectors. The Makivic patent discloses a Monte Carlo method that computes an implied volatility, and makes the process more efficient through sampling different regions of the price path space according to the respective contributions to the payoff function. However, neither the Glasserman nor the Makivic patents teach or suggest determining a present value distribution of contingent future benefits.

Applicants therefore respectfully submit that none of the Glasserman, Shepherd or Makivic patents teach or suggest determining a present value distribution of contingent future benefits. As such, any combination of the Glasserman, Shepherd or Makivic patents also fail to teach or suggest determining a present value distribution of contingent future benefits. However, even if the Glasserman, Shepherd and Makivic patents did disclose various elements of the claimed invention of independent Claims 1, 10 and 19, Applicants respectfully submit that the Glasserman, Shepherd and Makivic patents cannot properly be combined to teach the claimed invention. Generally, both the Glasserman and Makivic patents focus on techniques for improving Monte Carlo simulations. And the Shepherd patent focuses on applying a net present value (NPV) technique to calculate an expected value for traded contracts. The claimed invention of the present application, on the other hand, is capable of using real world values. As such, the claimed invention does not require a simulation technique, such as the Monte Carlo simulation techniques of Glasserman or Makivic, to value a contingent claim, in contrast to expected value of a traded contract as disclosed by the Shepherd patent.

More particularly, for example, the Glasserman future value distributions are extrapolated from an S_0 price assumption at T_0 (time zero or start of project) using a single risk-free rate (Table 1), which can vary (Table 2) using $n = 16$ or $n = 64$ steps in the Monte-Carlo generated path. Extrapolating the future value distributions from such assumptions creates an artificial set-up for probabilities to find economic value. This artificial set up is the conventional risk-neutral option valuation approach initially formulated in the Black-Scholes equation, which is well known to those skilled in the art and has served as the basis for pricing options (contingent claims). *See* JOHN C. HULL, OPTIONS, FUTURES, AND OTHER DERIVATIVES (5th ed. 2002).

In the conventional option pricing approach, this artificial set up is essentially a mathematical framing transformation by which an equivalence is established between the present value payoff from the call option in the artificial risk-neutral world, and the payoff in the real world from the so-called "replicating portfolio." Provided all calculations in the traditional risk-neutral approach continue in this artificial framework for projecting future value distributions, the resulting option value at T_0 will be correct. However, any intermediate steps, including the Glasserman future value distributions, are expressed in artificial risk-neutral prices and probabilities. Therefore, in the set of values comprising the Glasserman distributions, such as G(a)f(a) and G(z)f(z) (Fig 2/201) (*see* col. 2, ll. 65-67), the option payoff value (price) and

probability value are the risk-free future values, or risk-neutral future value distributions as it is typically termed in the art. The Glasserman distributions are not real-world price and probability combinations. The appropriate discount rate for the real world counterparts is not easily available whereas the artifacts can be appropriately discounted at the risk-free rate because they exist in the artificial risk-neutral world. One skilled in the art would easily recognize that the Glasserman functions cannot be readily extrapolated and utilized due to the mathematical framing transformation that results from the artificial set of values from the Glasserman distributions.

Applicants note that, as the Glasserman patent is not focused on how to price an option, the use of the set of artificial future distribution values is not explicitly explained in the Glasserman patent. Indeed, the Glasserman patent is drawn to improving the efficiency of a conventional risk-neutral approach by choosing an importance sampling (IS) distribution from a parameterized class of distributions based upon an optimization of a derivative security payoff function G(z) times a probability density function (z). *See* col. 1, ll. 11-20. Nowhere does the Glasserman patent explain how the given numerical examples with various parameters are combined to create G(z) and (z). *See id.* at col. 7, l. 62 – col. 8, l. 25. Rather, the Glasserman patent discloses a conventional future risk-neutral approach that utilizes the parameters in an artificial set up, which in turn, creates a mathematical framing transformation of G(z) and (z). Indeed, as shown in blocks 508 and 606 of FIGS. 5 and 6 of the Glasserman patent, respectively, the contents of A and B are both transformed values of price and probability. It is only when all calculations in the traditional risk-neutral approach continue in this artificially transformed framework that the resulting option value of the Glasserman system is be correct. And while the Makivic system may also utilize an artificially transformed framework, the Shepherd system does not utilize such an artificially transformed framework. Thus, even if the Glasserman and Makivic systems could be combined into a system for further improving Monte Carlo simulation, the combination could not be then combined with the Shepherd patent, much less combined to teach or suggest the claimed invention of the present application since to do so would change the principle of operation of the system disclosed by combination of the Glasserman and Makivic patents. M.P.E.P. § 2143.01 (explaining that "[a] proposed modification cannot change the principle of operation of a reference" to support an obviousness assertion).

As explained above, then, none of the Glasserman, Shepherd and Makivic patents, individually or in combination, teach or suggest determining a present value distribution of

contingent future benefits with a first discount rate, or determining a present value of a contingent future investment with a second discount rate that can differ from a first discount rate, as recited in independent Claims 1, 10 and 19. Even if the Glasserman, Shepherd, and Makivic patents did teach those aspects of the claimed invention, however, the Glasserman, Shepherd and Makivic patents cannot properly be combined to teach the claimed invention of independent Claims 1, 10 and 19. As such, Applicants respectfully submit that independent Claims 1, 10 and 19, and by dependency Claims 2-9, 11-18 and 20-27, are patentably distinct from the Glasserman, Makivic and Shepherd patents, taken either individually or in combination.

B. Whether Claims 1-27 are properly rejected under 35 U.S.C. § 112, Second Paragraph

Claims 1-27 of the present application stand rejected under 35 U.S.C. § 112, second paragraph, as failing to set forth the subject matter which Applicants regard as the invention. More particularly, the final Official Action, and incidentally the first Official Action of the parent to the present application, indicated that Applicants are requested to present the defining equations, conditions and assumptions in the model formulation, along with the derivations, in sufficient detail so that one of ordinary skill in the art can evaluate the model. Applicants again respectfully submit, however, that the claims do, in fact, set forth the subject matter which Applicants regard as the invention.

As described in M.P.E.P. § 2171, the requirement under § 112, second paragraph, that the claims set forth the subject matter that Applicants regard as the invention, is a subjective requirement as it depends on what the Applicants regard as their invention. In this regard, M.P.E.P. § 2172 states that "[a] rejection based on the failure to satisfy [the requirement that the claims set forth the subject matter that the applicant regards as the invention] is appropriate only where applicant has stated, somewhere other than in the application as filed, that the invention is something different from what is defined by the claims." (emphasis added). Section 2172 continues by stating that "the invention set forth in the claims must be presumed, in the absence of evidence to the contrary, to be that which applicants regard as their invention." *Id. (citing In re Moore*, 439 F.2d 1232 (C.C.P.A. 1971)).

Applicants respectfully submit that the current set of claims do, in fact, set forth the subject matter which Applicants regard as the invention. In this regard, Applicants have given

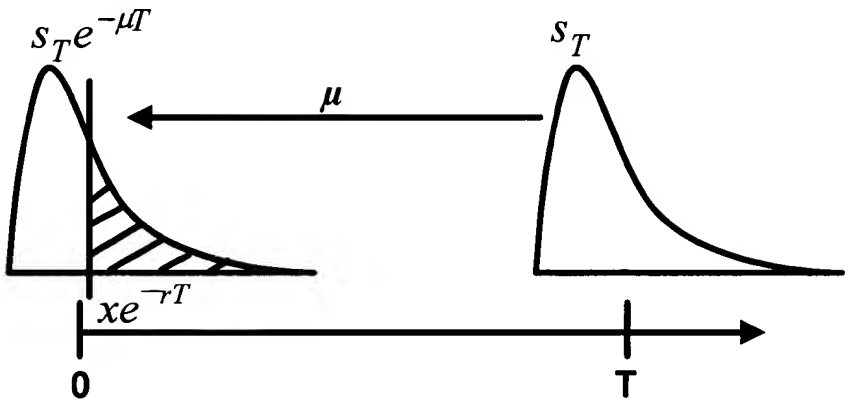
no indication, nor has any evidence been put forth to show, that the scope of the claims do not correspond in with that which Applicants regard as their invention, particularly since the content of Applicants' specification cannot be used as evidence that the scope of the claims do not correspond with the subject matter Applicants regard as their invention.

Applicants note that the Official Action requested that Applicants present the defining equations, conditions, assumptions in the model formulation, and the derivations, in sufficient detail such that one of ordinary skill in the art can evaluate the model. Applicants submit, however, that the specification does include model equations, conditions, assumptions and derivations in sufficient detail to enable one skilled in the art to practice the claimed invention. As previously explained, as described on page 15 of the present application, the valuation of a contingent claim according to the present invention can be represented as given in the following equation (1):

$$E[\max(s_T e^{-\mu T} - x e^{-rT}, 0)]$$

where s_T is the random value of the asset at the time (T) the contingent claim may be exercised time, μ is the first discount rate (e.g., WACC), x is the contingent future investment, and r is the second discount rate (e.g., risk free rate).

As also previously explained, the derivation of this equation is depicted by the figures and described by the text of the application. For example, shown below is a representation of FIG. 2 of the present application that includes a representation of the present value of a contingent future investment to graphically illustrate an application of equation (1). As shown on the right-hand side of the figure below, s_T can be represented by the distribution of contingent future benefits at time T, and as shown on the left-hand side, $s_T e^{-\mu T}$ represents the present value distribution of contingent future benefits at time zero (s_T having been discounted by the first discount rate μ). Pat. App., p. 11, l. 24 – p. 12, l. 6; FIG. 1, block 10; and FIG. 2.



Similarly, as shown, xe^{-rT} represents the present value of a contingent future investment. *Id.* at p. 12, l. 30 – p. 13, l. 7; and FIG. 1, block 12. Implementing equation (1), then, the value of the contingent claim can be determined by subtracting xe^{-rT} from $s_T e^{-\mu T}$ (i.e., $s_T e^{-\mu T} - xe^{-rT}$). However, because potential loss is a possible outcome when the contingent claim is exercised, equation (1) limits the value of the contingent claim to instances in which the contingent claim has a value at least equal to zero (since the contingent claim will typically not be exercised if the contingent claim has a value less than zero). Thus, as determined by equation (1), the value of the contingent claim is related to the shaded region ($s_T e^{-\mu T} - xe^{-rT}$) of the figure shown above. Presented in a reverse cumulative format, FIG. 3 of the present application illustrates the distribution resulting from the maximum of $s_T e^{-\mu T} - xe^{-rT}$ and zero. The value of the contingent claim, then, can be shown to equal $E[\max(s_T e^{-\mu T} - xe^{-rT}, 0)]$. *Id.* at p. 13, ll. 8-28; p. 14, ll. 24-30; and FIG. 1, block 14.

As explained during the telephone interview, it is well known that cashflows are discounted using rates related to underlying risk. For example, net present value can be determined by discounting expected future recurring profits at a discount rate, μ, and discounting the future guaranteed investment at the risk free rate. In notational terms, then, net present value can be determined as follows:

$$NPV = E[s_T]e^{-\mu T} - xe^{-rT}$$

Techniques such as net present value, however, do <u>not</u> capture the optionality of a discretionary investment. To capture the option value (value of a contingent claim), as shown in equation (1), the claimed invention creates a present value distribution by discounting a distribution of profits

(benefits) at μ, and discounts discretionary investment at a second rate (e.g., risk-free rate). The maximum function (i.e., $\max(s_T e^{-\mu T} - xe^{-rT}, 0)$) can then be applied before the expected payoff is calculated. And by discounting the whole distribution (s_T), then calculating the expectation (after the max operation), embodiments of the present invention are capable of capturing the optionality evaluated by Black-Scholes, but in a more transparent and accessible manner with fewer restrictive assumptions.

Thus, as shown in the figures and described in the specification, the present application does, in fact, include model equations, conditions, assumptions and derivations in sufficient detail to enable one skilled in the art to practice the claimed invention. Applicants respectfully submit, then, that the current set of claims set forth the subject matter which Applicants regard as the invention, as required by 35 U.S.C. § 112, second paragraph.

C. Whether Claims 19-27 are Properly Rejected Under 35 U.S.C. § 101 for Failing to Describe a Concrete, Useful and Tangible Output

In the present application, Claims 19-27 stand rejected under 35 U.S.C. § 101 as failing to describe a concrete, useful and tangible output. Applicants respectfully submit, however, that the claims do, in fact, describe a concrete, useful and tangible output. Applicants also note that during a telephone interview with the Examiner regarding the final Official Action of the parent to the present application, the Examiner explicitly indicated that Claims 19-27 were rejected due to the format of the claims. The Examiner continued by indicating that if Claims 19-27 were amended to recite that the computer program product is for performing a method, and that computer-readable program code portions of the computer-readable medium are for performing the method, the rejection of the claims under § 101 would be overcome. Applicants so amended Claims 19-27 in a preliminary amendment to the present application, and did not receive the same § 101 rejection in the first Official Action of the request for continued examination (RCE) of the parent application. Applicants, then, are quite perplexed as to how Claims 19-27 are now again rejected under § 101 as not describing a concrete, useful and tangible output. In this regard, if the amendments to Claims 19-27 were insufficient to overcome the § 101 rejection, Applicants would not have expected the Examiner to indicate such amendments would overcome

the § 101 rejection, or at least to have repeated the same § 101 rejection in the first Official Action of the RCE.

Notwithstanding the previous amendments, however, as previously explained, the Court of Appeals for the Federal Circuit stated in *State Street Bank & Trust Co. v. Signature Financial Group Inc.* that a claimed invention must produce a "useful, concrete and tangible result." 149 F.3d 1368, 1373 (Fed. Cir. 1998). As described in M.P.E.P. § 2106, Part II.C., in analyzing the claims of an application, product claims will include limitations defining discrete physical structures that may be comprised of hardware or a combination of hardware and software. As also described, "a claimed computer-readable medium encoded with a data structure defined structural and functional interrelationships between the data structure and the computer software and hardware components which permit the data structure's functionality to be realized, and is thus statutory." *Id.* at Part IV.B.1.(a) (emphasis added). Thus, "[w]hen a computer program is recited in conjunction with a physical structure, such as a computer memory, Office personnel should treat the claim as a product claim." *Id.* (emphasis added). When a computer program is recited as part of a claim that recites an otherwise statutory article of manufacture, "the claim remains statutory irrespective of the fact that a computer program is included in the claim." *Id.*

Independent Claim 19 recites a computer program product that comprises a computer-readable storage medium. In turn, the computer-readable storage medium has computer-readable program code portions stored therein, where the computer-readable program code portions comprise the recited first, second and third executable portions. In this regard, the third executable portion determines a value of the contingent claim based upon a present value distribution of contingent future benefits and a present value of the contingent future investment. In other terms, consistent with the definition of statutory subject matter in M.P.E.P. § 2106, independent Claim 19 recites a computer program product comprising a computer memory encoded with three executable portions, i.e., the first, second and third executable portions.

Applicants also note that much as the claims at issue in *State Street*, the Claims 19-27 recite a computer program product that produces a "useful, concrete and tangible result." In *State Street*, the claims at issue were drawn to a system for permitting an administrator to monitor and record the flow of financial information and make all necessary calculations for maintaining a partner fund financial services configuration. 149 F.3d at 1371. In holding that the claimed system at issue in *State Street* was patentable subject matter, the court stated, "the

transformation of data, representing discrete dollar amounts, by a machine through a series of mathematical calculations into a final share price, constitutes a practical application of a mathematical algorithm, formula or calculation, because it produces 'a useful, concrete and tangible result' – a final share price momentarily fixed for recording and reporting purposes ...." *Id.* at 1373.

Similar to the claimed subject matter at issue in *State Street*, the computer program product of Claims 19-27 transform data into a value of a contingent claim. Such a value, then, can be used in contexts, such as in financial determinations and project evaluations, to determine whether to exercise the contingent claim, such as by further investing in a project. As such, the value of the contingent claim can be considered to be a "useful, concrete and tangible result" of the claimed computer program product. Applicants therefore respectfully submit that independent Claim 19, and by dependency Claims 20-27, recites statutory subject matter, as required by 35 U.S.C. § 101.

CONCLUSION

For at least the foregoing reasons, Applicants respectfully request that the rejections be reversed. Applicants also note that the rejections of the claims in the final Official Action are essential duplicates of the rejections of the claims in the first Official Action of the parent of the present application. Applicants further note that, as suggested above with respect to the § 101 rejection, none of the previous rejections from the first Official Action were repeated in the first Official Action of the RCE, with the exception of the § 112, second paragraph, rejection, which differed in substance. Then, all of the rejections from the first Official Action of the parent reappeared in the final Official Action, with no explanation or mention of the § 112, second paragraph rejection from the first Official Action of the RCE. Applicants therefore also respectfully request a measure of consistency during prosecution of the present application so that issues during prosecution of the present application can be most efficiently be addressed to conclusion.

Respectfully submitted,

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Sarah B. Simmons

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CLAIMS ON APPEAL

1. (Original) A method for performing a contingent claim valuation comprising:

determining a present value distribution of contingent future benefits attributable to the exercise of the contingent claim at a subsequent time, wherein determining the present value distribution of contingent future benefits comprises discounting a distribution of contingent future benefits according to a first discount rate;

determining a present value of a contingent future investment required to exercise the contingent claim at the subsequent time based upon a second discount rate that need not equal the first discount rate; and

determining a value of the contingent claim based upon the present value distribution of contingent future benefits and the present value of the contingent future investment.

2. (Original) A method according to Claim 1 wherein determining the value of the contingent claim comprises determining an average of the difference between the present value distribution of contingent future benefits and the present value of the contingent future investment.

3. (Original) A method according to Claim 2 wherein, at the time at which the contingent claim is to be exercised, a potential loss remains a possible outcome, and wherein determining the average comprises limiting the difference between the present value distribution of contingent future benefits and the present value of the contingent future investment to a minimum value of zero in instances in which the present value distribution of contingent future benefits is less than a difference of the present value of the contingent future investment and the potential loss.

4. (Original) A method according to Claim 1 wherein determining the present value distribution of contingent future benefits comprises determining the present value distribution of contingent future benefits of a distribution of contingent future benefits that has a non-log normal distribution.

5. (Original) A method according to Claim 1 wherein determining the present value of the contingent future investment comprises determining the present value distribution of contingent future investments of a distribution of contingent future investments required to exercise the contingent claim at the subsequent time.

6. (Original) A method according to Claim 1 wherein determining the present value of a contingent future investment required to exercise the contingent claim at the subsequent time comprises discounting the contingent future investment by a risk free rate of discounting.

7. (Original) A method according to Claim 1 wherein determining the present value distribution of contingent future benefits comprises discounting the distribution of contingent future benefits by a weighted average cost of capitol.

8. (Original) A method according to Claim 1 further comprising:

repeating the determination of the present value distribution of contingent future benefits, the present value of a contingent future investment and the value of a contingent claim in order to value each of a series of contingent claims; and

refining the valuation of each contingent claim with the determination of the present value distribution of future benefits of a respective contingent claim comprising determining the present value of the value previously determined for an immediately succeeding contingent claim.

9. (Original) A method according to Claim 1 wherein a project comprises a pilot phase extending from an initial time to the subsequent time and a commercial phase following the subsequent time and contingent upon the exercise of the contingent claim, wherein the method further comprises obtaining a distribution of net operating profit at the subsequent time contingent upon the exercise of the contingent claim, and wherein the distribution of net operating profit is the distribution of contingent future benefits.

10. (Original) A system for performing a contingent claim valuation comprising a processing element capable of determining a present value distribution of contingent future

benefits attributable to the exercise of the contingent claim at a subsequent time, wherein said processing element determines the present value by discounting a distribution of contingent future benefits according to a first discount rate, said processing element also capable of determining a present value of a contingent future investment required to exercise the contingent claim at the subsequent time based upon a second discount rate that need not equal the first discount rate, and said processing element further capable of determining a value of the contingent claim based upon the present value distribution of contingent future benefits and the present value of the contingent future investment.

11. (Original) A system according to Claim 10 wherein said processing element determines the value of the contingent claim by determining an average of the difference between the present value distribution of contingent future benefits and the present value of the contingent future investment.

12. (Original) A system according to Claim 11 wherein, at the time at which the contingent claim is to be exercised, a potential loss remains a possible outcome, and wherein said processing element limits the difference between the present value distribution of contingent future benefits and the present value of the contingent future investment to a minimum value of zero in instances in which the present value distribution of contingent future benefits is less than a difference of the present value of the contingent future investment and the potential loss.

13. (Original) A system according to Claim 10 wherein said processing element is capable of determining the present value distribution of contingent future benefits of a distribution of contingent future benefits having a non-log normal distribution.

14. (Original) A system according to Claim 10 wherein said processing element is capable of determining the present value distribution of contingent future investments of a distribution of contingent future investments required to exercise the contingent claim at the subsequent time.

15. (Original) A system according to Claim 10 wherein said processing element determines the present value of a contingent future investment required to exercise the contingent claim at the subsequent time by discounting the contingent future investment by a risk free rate of discounting.

16. (Original) A system according to Claim 10 wherein said processing element determines the present value distribution of contingent future benefits by discounting the distribution of contingent future benefits by a weighted average cost of capitol.

17. (Original) A system according to Claim 10 wherein said processing element repeats the determination of the present value distribution of contingent future benefits, the present value of a contingent future investment and the value of a contingent claim in order to value each of a series of contingent claims, and wherein said processing element refines the valuation of each contingent claim with the determination of the present value distribution of future benefits of a respective contingent claim being determined based upon the present value of the value previously determined for an immediately succeeding contingent claim.

18. (Original) A system according to Claim 10 wherein a project comprises a pilot phase extending from an initial time to the subsequent time and a commercial phase following the subsequent time and contingent upon the exercise of the contingent claim, wherein said processing element initially obtains a distribution of net operating profit at the subsequent time contingent upon the exercise of the contingent claim, and wherein the distribution of net operating profit is the distribution of contingent future benefits.

19. (Previously Presented) A computer program product for performing a method of valuing a contingent claim, the computer program product comprising a computer-readable storage medium having computer-readable program code portions stored therein for performing the method, the method comprising:

determining a present value distribution of contingent future benefits attributable to the exercise of the contingent claim at a subsequent time, wherein determining a present value

distribution comprises discounting a distribution of contingent future benefits according to a first discount rate;

determining a present value of a contingent future investment required to exercise the contingent claim at the subsequent time based upon a second discount rate that need not equal the first discount rate; and

determining a value of the contingent claim based upon the present value distribution of contingent future benefits and the present value of the contingent future investment.

20. (Previously Presented) A computer program product according to Claim 19 wherein determining the value of the contingent claim comprises determining an average of the difference between the present value distribution of contingent future benefits and the present value of the contingent future investment.

21. (Previously Presented) A computer program product according to Claim 20 wherein, at the time at which the contingent claim is to be exercised, a potential loss remains a possible outcome, and wherein determining the average comprises limiting the difference between the present value distribution of contingent future benefits and the present value of the contingent future investment to a minimum value of zero in instances in which the present value distribution of contingent future benefits is less than a difference of the present value of the contingent future investment and the potential loss.

22. (Previously Presented) A computer program product according to Claim 19 wherein determining the present value distribution of contingent future benefits comprises determining the present value distribution of contingent future benefits of a distribution of contingent future benefits that has a non-log normal distribution.

23. (Previously Presented) A computer program product according to Claim 19 wherein determining the present value of a contingent future investment comprises determining the present value distribution of contingent future investments of a distribution of contingent future investments required to exercise the contingent claim at the subsequent time.

24. (Previously Presented) A computer program product according to Claim 19 wherein determining the present value of a contingent future investment required to exercise the contingent claim at the subsequent time comprises discounting the contingent future investment by a risk free rate of discounting.

25. (Previously Presented) A computer program product according to Claim 19 wherein determining the present value distribution of contingent future benefits comprises discounting the distribution of contingent future benefits by a weighted average cost of capitol.

26. (Previously Presented) A computer program product according to Claim 19 wherein the method further comprises:

repeating the determination of the present value distribution of contingent future benefits, the present value of a contingent future investment and the value of a contingent claim in order to value each of a series of contingent claims; and

refining the valuation of each contingent claim with the determination of the present value distribution of future benefits of a respective contingent claim comprising determining the present value of the value previously determined for an immediately succeeding contingent claim.

27. (Previously Presented) A computer program product according to Claim 19 wherein a project comprises a pilot phase extending from an initial time to the subsequent time and a commercial phase following the subsequent time and contingent upon the exercise of the contingent claim, wherein the method further comprises obtaining a distribution of net operating profit at the subsequent time contingent upon the exercise of the contingent claim, and wherein the distribution of net operating profit is the distribution of contingent future benefits.